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DOCUMENT-IDENTIFIER: US 6472470 B1  
TITLE: Vinyl alcohol polymer and its composition

Brief Summary Text (5):

Polyvinyl alcohol (hereinafter sometimes referred to as "PVA"), being one of a few crystalline, water soluble polymers, has excellent film formability, transparency, strength properties and interfacial activity. The polymer has therefore been widely used as a paper modifying agent such as coating agent for paper or additive for paper manufacturing process, an adhesive for paper, wood, inorganic materials and the like, a sizing agent for filling, a stabilizer for emulsion polymerization and suspension polymerization and as various binders. Furthermore, polyvinyl alcohol is important as a raw material for films, sheets and the like made of polyvinyl alcohol.

Brief Summary Text (6):

"Completely saponified PVA" having a degree of saponification of about 98 mole % and "partially saponified PVA" having one of about 88 mole % are known as conventional PVAs. In addition, development of high-performance PVAs by introduction of some functional groups to improve specific properties has been performed and, as a result, various modified polyvinyl alcohols are available.

Brief Summary Text (11):

PVAs also have the advantages of having excellent gas-barrier properties and transparency and causing little waste treatment problems, so that films utilizing "completely saponified PVA" are sometimes used as gas-barrier layers. However, it is known that although PVA films have high gas-barrier properties at low moisture absorption, i.e. under dry atmosphere, they strongly absorb moisture to become of low gas-barrier properties under a relative humidity of about 70% or more. In order to decrease the moisture absorbing tendency of PVA, there has been used ethylene-vinyl alcohol copolymer (hereinafter referred to as "EVOH") having copolymerized at least 20 mole % of ethylene. EVOH however is insoluble in water, so that for use in the form of solution it should be dissolved in an organic solvent, which markedly worsen the work environment. There have also been proposed, in order to decrease the moisture absorbing tendency of PVA, use of modified PVAs having crosslinking property, use of PVA reacted with a coupling agent, and use of PVA reacted with another polymer to introduce crosslinking structure. However, these modified PVAs have still insufficient gas-barrier properties under high-moisture conditions perhaps due to formation of pores on crosslinking.

Brief Summary Text (68):

Among the above additives, fillers have the effects of increasing the hardness and rigidity to provide a solid hand, developing blocking-preventing property and controlling the rate of water-degradation or biodegradation. Examples of usable fillers are known inorganic fillers, e.g. kaolin, clay, talc, acid clay, silica, alumina, diatomaceous earth, bentonite, montmorillonite, knot clay, agalmatolite, alunite, porcelain clay, feldspar, graphite, pearlite, calcium carbonate, magnesium hydroxide, carbon black, titanium oxide, mica, zirconia, boron nitride, aluminum nitride, shirasu, glass and glass fiber; and organic fillers, e.g. urea-formaldehyde resin and melamine-formaldehyde resin. The average particle size of inorganic fillers usable in the present invention is, with no specific limitation though, preferably 0.1 to 100  $\mu\text{m}$ .

Brief Summary Text (71):

The vinyl alcohol polymer of the present invention may be melt molded by, for example, extrusion molding, injection molding, film formation by extrusion through a T-die, tubular film process, compression molding, transfer molding, molding into reinforced plastics, hollow molding, pressing, blow molding, calendering, foaming, vacuum forming and pressure-vacuum molding. Another thermoplastic resin may as desired be laminated with the vinyl alcohol polymer of the present invention.

Brief Summary Text (83):

On producing a laminate by applying the vinyl alcohol polymer of the present invention on a base film, use of a crosslinking agent in combination is desirable, although the vinyl alcohol polymer may be used alone. Examples of the crosslinking agent are epoxy compounds, isocyanate compounds, aldehyde compounds, silica compounds, aluminum compounds, zirconium compounds and boron compounds, of which silica compounds, such as colloidal silica and alkyl silicates are preferred. These crosslinking agents are added in an amount based on 100 parts by weight of the vinyl alcohol polymer of, generally 5 to 60 parts by weight, preferably 10 to 40 parts by weight, more preferably 15 to 30 parts by weight. A high addition exceeding 60 parts by weight sometimes impairs the oxygen-barrier property. } XX

Brief Summary Text (89):

Gas-barrier laminated films comprising a film layer of the vinyl alcohol polymer generally further have a layer of a heatsealable resin on the polymer layer. The heatsealable resin layer is generally formed by extrusion lamination or dry lamination. Examples of the heatsealable resin are polyethylene resins, e.g. HDPE, LDPE and LLDPE, polypropylene resin, ethylene-vinyl acetate copolymer, ethylene- $\alpha$ -olefin random copolymers and ionomer resins.

Brief Summary Text (91):

The vinyl alcohol polymer of the present invention, having a specific ethylene content, polymerization degree and degree of saponification, and a specific amount of carboxyl group and lactone rings, 1,2-glycol bond and 3 successive vinyl alcohol unit chain, and its composition can be used for examples as the following items. That is, they are usable as sizing agent for fibers, fiber treating agent, fiber processing agent, sizing agent for textile products, paper processing agents, e.g. clear-coating agent for paper, pigment-coating agent for paper, sizing agent to be added to slurry for producing paper, and binder for overcoating of heat-sensitive paper, heat-sensitive adhesive, defogging agent, paints, dispersing agent for organic and inorganic pigments, dispersion-stabilizing agent for emulsion polymerization, dispersion-stabilizing agent for polymerization of vinyl chloride, adhesive for paper, wood and plastics, binder for nonwovens, binder for fibers, binder for ceramics, binder for various construction materials such as gypsum board and fiber board, additive for cement and mortar, hot-melt adhesive, image-forming material, photosensitive resin, raw material for polyvinyl acetal for formal resins and butylal resins, substrate for gel, raw material for shaped articles such as films, sheets and tubes and soil conditioner. The vinyl alcohol polymer of the present invention may, utilizing its features, be either used alone or in combination with other polymers, e.g. unmodified or modified PVAs, starch (and its modified products), cellulose derivatives, gums, gelatin and casein; and plasticizers.

Detailed Description Text (49):

Melt extrusion molding was conducted by using the pellets obtained above as raw materials and under any one of the following molding temperature conditions, to obtain films. The obtained films were evaluated for the thermal stability of the polymers used. The results of evaluation were reported in terms of the following 5-stage rating, and are shown in Table 17 through Table 19.

Detailed Description Text (50):

Melt Extrusion Molding Conditions Extruder: Laboplastmil made by Toyo Seikan Co., Ltd. Screw: Full-flight type Screw rotation: 200 rpm Motor load current: 3.3 A Throughput: 2.2 kg/hr Film thickness: 40  $\mu$ m

Detailed Description Text (51):

(Extrusion Molding Temperature Conditions A) Cylinder 1: 180.degree. C. Cylinder 2:

210.degree. C. Cylinder 3: 230.degree. C. Cylinder 4: 230.degree. C. Cylinder 5:  
230.degree. C. Die: 225.degree. C.

Detailed Description Text (52):

(Extrusion Molding Temperature Conditions B) Cylinder 1: 160.degree. C. Cylinder 2:  
190.degree. C. Cylinder 3: 210.degree. C. Cylinder 4: 210.degree. C. Cylinder 5:  
210.degree. C. Die: 205.degree. C.

Detailed Description Text (53):

(Extrusion Molding Temperature Conditions C) Cylinder 1: 150.degree. C. Cylinder 2:  
180.degree. C. Cylinder 3: 200.degree. C. Cylinder 4: 200.degree. C. Cylinder 5:  
200.degree. C. Die: 195.degree. C.

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END OF SEARCH HISTORY